

1. SCIENTIFIC STUDIES AT DIEGO GARCIA ATOLL

D. R. Stoddart

Introduction

The islands of the Chagos Archipelago (Fig. 1) are of interest for several reasons. First, they are the wettest coral islands in the Indian Ocean, with mean annual rainfalls of up to more than 3700 mm: one would thus expect marked ecological differences between these islands and the much drier ones in the western Indian Ocean. Second, the Chagos islands are situated in the centre of the Indian Ocean and form the termini of sequences of islands (the Maldives and Laccadives in linear array to the north, and the more scattered array of islands in the western Indian Ocean) which display marked differences in distance from continental land, in area, climate, and habitat diversity. Any analysis of Indian Ocean island biotas must thus take into account the status of the islands of the Chagos Archipelago. And finally, in common with areas on the Mid-Ocean Ridge, the present dry-land areas of the Chagos represent only a minute proportion of the total land area exposed during the last Pleistocene low stand of the sea. It is probable that 17,000 years ago Great Chagos Bank had a dry land area of 13,500 sq km, with other large land areas in Speaker's Bank and Pill Bank and smaller ones in the present atolls of Peros Banhos, Salomon and Diego Garcia. The flora and fauna present on such areas would be potentially much larger than on the present islands, and it would be at least theoretically possible that some elements of this larger biota survived during the Holocene transgression of the sea. In the event, no such survivals have been found, at least on Diego Garcia: all the plants and animals, other than deliberate introductions, have probably reached the Chagos by trans-oceanic dispersal in Holocene times.

The opportunity to visit Diego Garcia Atoll during a hydrographic survey by H.M.S. Vidal in 1967 was therefore a most welcome one. In recent years there has been renewed interest in Indian Ocean coral islands, taking up many of the problems explored by J. Stanley Gardiner and R. B. Seymour Sewell 30-70 years ago. These recent studies have concerned both reef and shoreline ecology (Stoddart and Yonge, eds., 1971)* and the terrestrial ecology of islands, in the Maldives (Stoddart,

* References cited in Chapters 1, 2, 3, 11, 14 and 18 are grouped in Chapter 19 of this report; in other chapters the references are grouped at the end of the chapter.

ed., 1966), at Aldabra (Stoddart, ed., 1967), and at other western Indian Ocean islands (Stoddart, ed., 1970). A general picture of variation in Indian Ocean coral islands, and of the factors contributing to it, is now emerging (Stoddart 1969, Peake 1971), based partly on the recent studies but also to a considerable extent on the records contained in a voluminous literature resulting from earlier expeditionary work. The present study of Diego Garcia Atoll adds to this body of knowledge: with the exception of a short visit by the Yale Seychelles Expedition to Peros Banhos Atoll in 1957 (Kohn 1964) it represents the first modern study of any of the Chagos group of atolls.

Previous Work

There have been three main scientific investigations on Diego Garcia in the past: by G. C. Bourne from September 1885 to January 1886; by the Deutsche Tiefsee-Expedition in the Valdivia, in February 1899; and by the Percy Sladen Trust Expedition, with J. Stanley Gardiner, C. Forster Cooper and T. Bainbrigge Fletcher, from 7 to 13 July 1905. Collections were also made by J. Morin in July 1937, and an excellent but unpublished general account was written by P. O. Wiehe following a visit in May-June 1939. Wiehe made further small collections in September 1961. Each of these, except for G. C. Bourne and the Valdivia Expedition, also visited Peros Banhos, Egmont and Salomon Atolls.

Table 1 briefly lists the main scientific visitors to Diego Garcia since 1884, with their fields of interest and the general publications resulting from their work. The earlier history of the atoll, including hydrographic surveys made before 1884, is outlined in Chapter 18 of this volume, and more extensive references to the earlier scientific work are given in several later chapters but particularly in Chapter 14. A full bibliography of the atoll is given in Chapter 19.

Early general accounts of Diego Garcia are those by Moresby (1844, Anon. 1845), Pridham (1846) and Finsch (1887). G. C. Bourne, after four months' fieldwork, published a general paper (1886a) and papers on the geomorphology (1888a, 1888b); his plants were worked up by Hemsley (1887) and his birds by Saunders (1886). Chun (1903) published a long general account of the atoll, with the first published photographs, after the Valdivia Expedition, and references to collections made there are scattered through the *Wissenschaftliche Ergebnisse der Deutschen Tiefsee-Expedition*: on birds (Reichenow 1900, Vanhoffen 1901), marine algae (Reinbold 1904), echinoderms (Döderlein 1906, Hertz 1927, Heding 1940), Crustacea (Balss 1912, Doflein 1904, Doflein and Balss 1913), Mollusca (von Martens 1904, Thiele and Jaeckel 1931), and Phytoplankton (Karsten 1907). The most substantial accounts are, however, those resulting from the week's visit of H.M.S. Sealark with the Percy Sladen Trust Expedition in July 1905. During this time Gardiner with Fletcher worked mainly on the land and Cooper in the lagoon. General descriptions were published by Gardiner and Cooper (1907) and by Gardiner

Table 1. Scientific studies at Diego Garcia

<u>Date</u>	<u>Investigator</u>	<u>Field of study</u>	<u>References</u>
1883	A. Hume, H.M.S. <u>Moorhen</u>	Plants	Hemsley 1884
1884 July 9	O. Finsch	Birds	Finsch 1887; Finsch and Blasius 1887
1885	Cdr F.C.P. Vereker H.M.S. <u>Rambler</u>	Hydrographic survey	Admiralty chart 920
1885 Sept. 15- 1886 Jan.	G. C. Bourne	General, geology, birds, plants	Bourne 1886a, 1886b, 1888a, 1888b
1889	R. F. M. Wilson	Lichens	Wilson 1889
1899 Feb.	Deutsche Tiefsee- Expedition, <u>Valdivia</u>	General, marine fauna, birds	Chun 1903
1905 July 7- 13	Percy Sladen Trust Expedition, H.M.S. <u>Sealark</u>	Geomorphology, marine fauna, terrestrial fauna and flora	Gardiner 1903, 1905, 1906, 1936; Gardiner and Cooper 1907
1936	J. Morin	Mollusca, Crustacea	Madge 1946; Viader 1937; Ward 1942
1937 July	J. Morin	Plants	
1938	J. Closel	Mollusca	
1939 May- June	P. O. Wiehe	General, plants, insects	Wiehe 1939
1941-2	H.M.I.S. <u>Clive</u> , Cdrs J. W. Jefford and R. R. Caws	Hydrographic survey	Admiralty chart 920
1948	Mauritius-Seychelles Fisheries Survey: J.F.G. Wheeler and F. D. Ommanney	Fish	Ommanney 1952
1960 Nov.- Dec.	P. Loustau-Lalanne	Birds	Loustau-Lalanne 1962
1961	P. O. Wiehe	Plants	
1961	<u>Vitiaz</u>	Beach fauna	Bezrunov 1963
1964 July- Aug.	Lt P.G. Odling-Smee	Birds	Bourne 1966
1967	<u>Vitiaz</u>	Geomorphology	Dolotov 1968; Leont'yev 1969
1967 June- July	H.M.S. <u>Vidal</u> , Capt. C.R.K. Roe	Hydrographic survey	
1967 June- July	H.A. Fehlmann, C. F. Rhyne, D.R. Stoddart, J.D. Taylor	Geography and eco- logy, marine and terrestrial	This volume; Ripley 1969; Benson 1970

(1936, 416-420, also 1931). Table 2 lists papers resulting from the Percy Sladen Trust Expedition dealing with marine fauna and flora; Table 8 in Chapter 14 lists the many papers dealing with insects. Willis and Gardiner (1931) list the land flora. Most of the Percy Sladen collections are in the British Museum (Natural History), except for the plants, which are at the Royal Botanic Gardens, Kew.

After the Percy Sladen Trust Expedition, no further collections appear to have been made until J. Morin's visit. Morin was a museum assistant in Mauritius and his zoological collections are in the Mauritius Institute, Port Louis. Crustacea collected by him at Diego Garcia, Peros Banhos and Salomon in 1936 were described by Ward (1942), his land Mollusca by Madge (1946), and his marine Mollusca by Viader (1937) (but without localities). The Mauritius Herbarium at Réduit also contains a number of sheets of plants from Diego Garcia, dated June-August 1937: it is not known whether Morin made two visits to the archipelago, or whether some mislabelling has occurred. Further marine mollusca in the Mauritius Institute from Diego Garcia were collected by J. Closel in 1938. Wiehe's visit in 1939 resulted in a large collection of plants, now in the Mauritius Herbarium (Wiehe 1939), not only from Diego Garcia but also from Salomon and Peros Banhos, together with some insects (Mamet 1941, 1943). More plants in the Herbarium were collected on these three atolls and also on Egmont in 1961, again by Wiehe.

Subsequent visits have resulted mainly in sight records, particularly of birds, and Loustau-Lalanne (1962) has contributed a general account of the birds of the Chagos Archipelago following a visit in 1960. For other recent visits, see Table 1.

Present Investigation

The present investigation was carried out during June and July 1967 by four scientists attached to a British Ministry of Defence hydrographic survey carried out by H.M.S. Vidal. These were Dr. H. A. Fehlmann, Smithsonian Oceanographic Sorting Center, and Mr. C. F. Rhyne, Smithsonian Institution and now, the University of North Carolina, both nominated by the Smithsonian Institution; and Dr D. R. Stoddart, Cambridge University, and Dr J. D. Taylor, British Museum (Natural History), both nominated by The Royal Society. Stoddart and Taylor were on Diego Garcia from 1-29 July, Rhyne and Fehlmann from 10 June to 29 July. The purpose of the scientific party was to make a survey of the present status of the geography and ecology of the atoll and if necessary to make conservation recommendations.

Responsibilities were divided as follows. Fehlmann made large collections of fish, which are being distributed by the Smithsonian Oceanographic Sorting Center; he also made smaller collections of other marine groups; of birds, particularly the Little Green Heron (Ripley

Table 2. Studies of marine biota by the Percy Sladen Trust Expedition

MARINE ALGAE

Foslie 1907
Gepp and Gepp 1909
Weber-van Bosse 1913, 1914

PORIFERA

Dendy 1913, 1916, 1922

COELENTERATA

Browne, 1916, 1926
Cooper 1909
Gardiner 1909
Hickson and England 1909
Horst 1922, 1926
Jarvis 1922
Matthai 1914, 1928
Thomson and Mackinnon 1910

BRYOZOA

Thornely 1912

ANNELIDA

Potts 1910

ECHINODERMATA

Bell 1909

ARTHROPODA

Borradaile 1907b, 1910, 1917
Coutière 1921
Laurie 1926
Rathbun 1911

MOLLUSCA

Eliot 1910
Melvill 1909

VERTEBRATA

Regan 1908

1969) and the Turtledove (Benson 1970); of reptiles; and of insects. Rhyne specialised on marine algae, and also collected land plants. Stoddart studied geomorphology and sedimentology, including lagoon floor sediments, and also collected land plants. Taylor concentrated on intertidal ecology and on the lagoon reefs, collecting corals, Mollusca and Crustacea; he also made some terrestrial collections, notably of land Mollusca and of earthworms. Most of these collections are reported in this volume. The main group very inadequately represented in the 1967 collections was the insects, and it is hoped that some work can be done on these in the near future.

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